AQUA SEWER EXHIBIT NO. 3.0

AQUA ILLINOIS, INC. – WOODHAVEN LAKES SEWER DIVISION

EXHIBIT

TO ACCOMPANY THE

DIRECT TESTIMONY

OF

PAULINE M. AHERN, CRRA
VICE PRESIDENT
AUS CONSULTANTS - UTILITY SERVICES

CONCERNING

COMMON EQUITY COST RATE

DECEMBER 2004

Aqua Illinois, Inc. – Woodhaven Lakes Sewer Division
Table of Contents
to Aqua Sewer Exhibit No. 3.0
of Pauline M. Ahern

Aqua Illinois, Inc. - Woodhaven Lakes Sewer Division
Summary of Cost of Capital and Fair Rate of Return
Based upon an Average Capital Structure Estimated for the Test Year Ended December 31, 2005

Type of Capital	Ratios (1)	Cost Rate	Weighted Cost Rate
Long-Term Debt	47.90 %	7.19 % (1)	3.446 % (1)
Short-Term Debt	0.38	3.07 (1)	0.012 (1)
Total Debt	48.28		3.458
Preferred Stock	0.32	5.48 (1)	0.018 (1)
Common Equity	51.39	11.30 (2)	5.807
Total	99.99 % (3)		9.283 %

Notes:

(1) From Schedule D -1, page 1.

(2) Based upon informed judgment from the entire study, the principal results of which are summarized on page 2 of this Schedule.

(3) Does not add due to rounding.

Aqua Illinois, Inc. - Woodhaven Lakes Sewer Division
Brief Summary of Common Equity Cost Rate

No.	Principal Methods	Proxy Group of Six C. A. Turner Water Companies	Proxy Group of Three Value Line (Standard Edition) Water Companies	Proxy Group of Fifteen Utilities Selected on the Basis of Least Relative Distance
1.	Discounted Cash Flow Model (DCF) (1)	10.6 %	11.0 %	10.8 %
2.	Risk Premium Model (RPM) (2)	10.6	10.8	10.9
3.	Capital Asset Pricing Model (CAPM) (3)	10.0	10.3	10.3
4.	Comparable Earnings Model (CEM) (4)	14.2	14.0	13.8
5.	Indicated Common Equity Cost Rate before Adjustment for Investment Risk	10.80 %	11.00 %	11.00 %
6.	Investment Risk Adjustment (5)	0.30	0.30	0.50
7.	Indicated Common Equity Cost Rate after Adjustment for Investment Risk	11.10 %	11.30 %	11.50 %
8.	Average		11.30%	
9.	Recommendation		11.30%	

Notes: (1) From Aqua Schedule 3.8.
(2) From page 1 of Aqua Schedule 3.14.
(3) From page Aqua Schedule 3.15.
(4) From page 2, 4 and 6 of Aqua Schedule 3.16.
(5) Investment risk adjustment to reflect Aqua IL's greater investment risk due to its small size and lower credit rating vis-à-vis each proxy group as detailed in Ms. Ahern's direct testimony.

Aqua Illinois, Inc. - Woodhaven Lakes Sewer Division
Derivation of Investment Risk Adjustment Based upon
Ibbotson Associates' Size Premia for the Decile Portfolios of the NYSE/AMEX/NASDAQ

Line No.		1 Total Capitalization (incl. Short-Term Debt) for the Year 2003 (millions)	(times larger)	2 Market Capitalization on December 7, 2004 (1) (millions)	(times larger)	3 Applicable Decile of the NYSE/AMEX/ NASDAQ	4 Applicable Size Premium		5 Spread from Applicable Size Premium (2)
1.	Aqua Illinois, Inc.	$ 112.954 (3)							
A.	Based upon the Proxy Group of Six C. A. Turner Water Companies			$ 136.749		9 - 10 (4)	4.62%	(5)	
B.	Based upon the Proxy Group of Three Value Line (Standard Edition) Water Companies			$ 132.125		9 - 10 (4)	4.62%	(5)	
C.	Based upon the Proxy Group of Fifteen Utilities Selected on the Basis of Least Relative Distance			$ 110.465		10 (4)	6.34%	(6)	
2.	Proxy Group of Six C. A. Turner Water Companies	$ 502.690 (7)	4.5 x	$ 605.425	4.4 x	7 - 8 (8)	1.91%	(9)	2.71%
3.	Proxy Group of Three Value Line (Standard Edition) Water Companies	$ 865.130 (10)	7.7	$ 1,054.633	8.0	6 (11)	1.59%	(12)	3.03%
4.	Proxy Group of Fifteen Utilities Selected on the Basis of Least Relative Distance	$ 6,719.260 (13)	59.5	$ 5,517.271	49.9	2 - 3 (14)	0.59%	(15)	5.75%

Decile	Number of Companies	Recent Total Market Capitalization (millions)	Recent Average Market (millions)
1 - Largest	168	$7,419,638.030	$44,164.512
2	186	1,471,629.952	7,911.989
3	198	746,716.927	3,771.298
4	200	451,145.013	2,255.725
5	221	337,041.577	1,525.075
6	277	290,452.647	1,048.566
7	343	238,327.258	694.832
8	379	171,437.318	452.341
9	613	168,889.652	275.513
10 - Smallest	1724	136,028.242	78.903

See page 4 for notes.

Aqua Illinois, Inc. – Woodhaven Lakes Sewer Division
Derivation of Investment Risk Adjustment Based upon
Ibbotson Associates' Size Premia for the Decile Portfolios of the NYSE

Notes:

(1) From page 5 of this Schedule.

(2) Line No. 1 – Line No. 2 and Line No. 1 – Line No. 3 of Columns 3 and 4, respectively. For example, the 2.71% in Column 5, Line No. 2 is derived as follows 2.71% = 4.62% - 1.91%.

(3) From page 1 of Aqua Schedule 3.3.

(4) With an estimated market capitalization of $136.749 million (based upon the proxy group of six C. A. Turner water companies), $132.125 (based upon the proxy group of three Value Line (Standard Edition) water companies), $110.465 (based upon the proxy group of fifteen utilities selected on the basis of least relative distance), Aqua Illinois, Inc. falls between the 9th and 10th deciles or in the 10th decile of the NYSE/AMEX/NASDAQ which have average market capitalizations of $177.208 million and $78.903 as can be gleaned from the information shown in the table on the bottom half of page 3 of this Schedule

(5) *Average size premium applicable* to the 9th and 10th deciles of the NYSE/AMEX/NASDAQ as shown on page 15 of this Schedule.

(6) Size premium applicable to the 10th decile of the NYSE/AMEX/NASDAQ as shown on page 15 of this Schedule.

(7) From page 1 of Aqua Schedule 3.4.

(8) With an estimated market capitalization of $605.425 million, the proxy group of six C. A. Turner water companies falls between the 7th and 8th deciles of the NYSE/AMEX/NASDAQ which have an average market capitalization of $573.587 million as can be gleaned from the information shown in the table on the bottom half of page 3 of this Schedule.

(9) Average size premium applicable to the 7th and 8th deciles of the NYSE/AMEX/NASDAQ as shown on page 15 of this Schedule.

(10) From page 1 of Aqua Schedule 3.5.

(11) With an estimated market capitalization of $1,054.633 million, the proxy group of three Value Line (Standard Edition) water companies falls in the 6th decile of the NYSE/AMEX/NASDAQ which has an average market capitalization of $1,048.566 million as can be gleaned from the information shown in the table on the bottom half of page 3 of this Schedule.

(12) Size premium applicable to the 6th decile of the NYSE/AMEX/NASDAQ as shown on page 15 of this Schedule.

(13) With an estimated market capitalization of $5,517.271 million, the proxy group fifteen utilities selected on the basis of least relative distance falls between the 2nd and 3rd deciles of the NYSE/AMEX/NASDAQ which have an average market capitalization of $5,841.644 million as shown in the table on the bottom half of page 3 of this Schedule.

(14) *Average size premium applicable* to the 2nd and 3rd deciles of the NYSE/AMEX/NASDAQ as shown on page 15 of this Schedule.

Source of Information: Ibbotson Associates, Stocks, Bonds, Bills and Inflation – Valuation Edition – 2003 Yearbook, Chicago, IL, 2003

Aqua Illinois, Inc. - Woodhaven Lakes Sewer Division
Market Capitalization of Aqua Illinois, Inc.
the Proxy Group of Six C. A. Turner Water Companies and the
the Proxy Group of Three Value Line (Standard (Edition) Water Companies and the
the Proxy Group of Fifteen Utilities Selected on the Basis of Least Relative Distance

Company	1 Common Stock Shares Outstanding at September 30, 2004 (millions)	2 Book Value per Share at September 30, 2004 (1)	3 Total Common Equity at September 30, 2004 (millions)	4 Closing Stock Market Price on December 7, 2004	5 Market-to-Book Ratio at December 7, 2004 (2)	6 Market Capitalization on December 7, 2004 (3) (millions)
Aqua Illinois, Inc.	0.750 (4)	$ 78.053	$ 58.540 (5)	NA		
Based upon the Proxy Group of Six C. A. Turner Water Companies					233.6 % (6)	$ 136.749 (7)
Based upon the Proxy Group of Three Value Line (Standard Edition) Water					225.7 % (8)	$ 132.125 (9)
Based upon the Proxy Group of Fifteen Utilities Selected on the Basis of Least Relative Distance					188.7 % (10)	$ 110.465 (10)
Proxy Group of Six C. A. Turner Water Companies						
American States Water Co.	15.318	$ 16.602	$ 254.303	$ 24.260	146.1 %	$ 371.615
Aqua America, Inc.	93.243	7.306	681.206	23.440	320.8	2,185.616
Artesian Resources Corp.	3.944	13.754	54.245	29.190	212.2	115.125
California Water Service Group	18.345	15.746	288.862	33.070	210.0	606.669
Middlesex Water Company	11.327	8.345	94.529	19.480	233.4	220.650
York Water Company	6.874	6.925	47.601	19.330	279.1	132.974
Average	24.842	$ 11.446	$ 236.791	$ 24.795	233.6 %	$ 605.425
Proxy Group of Three Value Line (Standard Edition) Water Companies						
American States Water Co.	$ 15.318	$ 16.602	$ 254.303	$ 24.260	146.1 %	$ 371.615
Aqua America, Inc.	93.243	7.306	681.206	23.440	320.8	2,185.616
California Water Service Group	18.345	15.746	288.862	33.070	210.0	606.669
	$ 42.302	$ 13.218	$ 408.124	$ 26.923	225.7 %	$ 1,054.633
Proxy Group of Fifteen Utilities Selected on the Basis of Least Relative Distance						
AGL Resources, Inc.	65.363	$ 15.651	$ 1,023.000	$ 32.480	207.5 %	$ 2,122.990
American States Water Co.	15.318	16.602	254.303	24.260	146.1	371.615
Aqua America, Inc.	93.243	7.306	681.206	23.440	320.8	2,185.616
California Water Services Group	18.345	15.746	288.862	33.070	210.0	606.669
Cinergy Corp.	180.996	20.990	3,780.939	41.640	199.3	7,536.673
Consolidated Edison, Inc.	241.326	29.479	7,114.000	43.730	148.3	10,553.186
Dominion Resources, Inc.	331.440	31.764	10,528.000	66.500	209.4	22,040.760
Green Mountain Power Corp.	5.930	18.105	107.360	26.900	148.0	158.924
KeySpan Corp.	160.357	23.324	3,740.232	38.280	164.1	6,139.486
Middlesex Water Company	11.327	8.345	94.529	19.480	233.4	220.650
Northwest Natural Gas Co.	27.373	20.032	548.324	32.230	160.9	882.232
Pinnacle West Capital Corp.	91.318	32.598	2,976.753	43.670	133.7	3,978.725
PNM Resources, Inc.	60.422	18.387	1,111.001	25.440	138.4	1,537.136
Southern Company	739.687	13.927	10,301.410	32.720	234.9	24,202.559
Southwest Water Company	17.303	7.307	126.429	12.880	176.3	222.863
Average	137.317	$ 18.631	$ 2,845.090	$ 33.101	188.7 %	$ 5,517.271

NA = Not Available

Notes:
(1) Column 3 / Column 1.
(2) Column 4 / Column 2.
(3) Column 5 * Column 3.
(4) From Schedule D - 7 , page 2.
(5) From WP-D1, at September 30, 2004.
(6) The market-to-book ratio of Aqua Illinois, Inc. at December 7, 2004 is assumed to be equal to the average market-to-book ratio at December 7, 2004 of the proxy group of six C. A. Turner Water Companies.
(7) Aqua Illinois, Inc.'s common stock, if traded, would trade at a market-to-book ratio equal to the average market-to-book ratio at December 7, 2004 of the proxy group of six C. A. Turner water companies, 233.6%, and Aqua Illinois' market capitalization at December 7, 2004 would therefore have been $136.749 million. ($136.749 = $58.540 * 233.6%).
(8) The market-to-book ratio of Aqua Illinois, Inc. at December 7, 2004 is assumed to be equal to the average market-to-book ratio at December 7, 2004 of the proxy group of three Value Line (Standard Edition) water companies.
(9) Aqua Illinois, Inc. common stock, if traded, would trade at a market-to-book ratio equal to the average market-to-book ratio at December 7, 2004 of the proxy group of three Value Line (Standard Edition) water companies, 225.7%, and Aqua Illinois' market capitalization at December 7, 2004 would therefore have been $132.125 million. ($132.125 = $58.540 * 225.7%).
(10) The market-to-book ratio of Aqua Illinois, Inc. at December 7, 2004 is assumed to be equal to the average market-to-book ratio at December 7, 2004 of the proxy group of fifteen utilities selected on the basis of least relative distance.
(11) Aqua Illinois, Inc. common stock, if traded, would trade at a market-to-book ratio equal to the average market-to-book ratio at December 7, 2004 of the proxy group of fifteen utilities selected on the basis of least relative distance, 188.7%, and Aqua Illinois' market capitalization at December 7, 2004 would therefore have been $110.465 million. ($110.465 = $58.540 * 188.7%).

Source of Information: Standard & Poor's Compustat Services, Inc., PC Plus Research Insight Data Base

Stocks, Bonds, Bills, and Inflation

SBBI

Valuation Edition
2004 Yearbook

Ibbotson Associates

Chapter 7

Firm Size and Return

The Firm Size Phenomenon

One of the most remarkable discoveries of modern finance is that of a relationship between firm size and return. The relationship cuts across the entire size spectrum but is most evident among smaller companies, which have higher returns on average than larger ones. Many studies have looked at the effect of firm size on return.[1] In this chapter, the returns across the entire range of firm size are examined.

Construction of the Decile Portfolios

The portfolios used in this chapter are those created by the Center for Research in Security Prices (CRSP) at the University of Chicago's Graduate School of Business. CRSP has refined the methodology of creating size-based portfolios and has applied this methodology to the entire universe of NYSE/AMEX/NASDAQ-listed securities going back to 1926.

The New York Stock Exchange universe excludes closed-end mutual funds, preferred stocks, real estate investment trusts, foreign stocks, American Depository Receipts, unit investment trusts, and Americus Trusts. All companies on the NYSE are ranked by the combined market capitalization of their eligible equity securities. The companies are then split into 10 equally populated groups, or deciles. Eligible companies traded on the American Stock Exchange (AMEX) and the Nasdaq National Market (NASDAQ) are then assigned to the appropriate deciles according to their capitalization in relation to the NYSE breakpoints. The portfolios are rebalanced, using closing prices for the last trading day of March, June, September, and December. Securities added during the quarter are assigned to the appropriate portfolio when two consecutive month-end prices are available. If the final NYSE price of a security that becomes delisted is a month-end price, then that month's return is included in the quarterly return of the security's portfolio. When a month-end NYSE price is missing, the month-end value of the security is derived from merger terms, quotations on regional exchanges, and other sources. If a month-end value still is not determined, the last available daily price is used.

Base security returns are monthly holding period returns. All distributions are added to the month-end prices, and appropriate price adjustments are made to account for stock splits and dividends. The return on a portfolio for one month is calculated as the weighted average of the returns for its individual stocks. Annual portfolio returns are calculated by compounding the monthly portfolio returns.

Size of the Deciles

Table 7-1 reveals that the top three deciles of the NYSE/AMEX/NASDAQ account for most of the total market value of its stocks. Approximately two-thirds of the market value is represented by the first decile, which currently consists of 168 stocks, while the smallest decile accounts for just over one percent of the market value. The data in the second column of Table 7-1 are averages across all

1 Rolf W. Banz was the first to document this phenomenon. See Banz, Rolf W. "The Relationship Between Returns and Market Value of Common Stocks," *Journal of Financial Economics*, Vol. 9, 1981, pp. 3–18.

78 years. Of course, the proportion of market value represented by the various deciles varies from year to year.

Columns three and four give recent figures on the number of companies and their market capitalization, presenting a snapshot of the structure of the deciles near the end of 2003.

Table 7-1

Size-Decile Portfolios of the NYSE/AMEX/NASDAQ Size and Composition 1926-2003

Decile	Historical Average Percentage of Total Capitalization	Recent Number of Companies	Recent Decile Market Capitalization (in thousands)	Recent Percentage of Total Capitalization
1-Largest	63.33%	168	$7,419,638,030	64.91%
2	13.99%	186	1,471,629,952	12.87%
3	7.57%	198	746,716,927	6.53%
4	4.74%	200	451,145,013	3.95%
5	3.24%	221	337,041,577	2.95%
6	2.37%	277	290,452,647	2.54%
7	1.72%	343	238,327,258	2.08%
8	1.27%	379	171,437,318	1.50%
9	0.97%	613	168,889,652	1.48%
10-Smallest	0.80%	1,724	136,028,242	1.19%
Mid-Cap 3–5	15.55%	619	1,534,903,517	13.43%
Low-Cap 6–8	5.36%	999	700,217,223	6.13%
Micro-Cap 9–10	1.77%	2,337	304,917,894	2.67%

Source: © 200403 CRSP® Center for Research in Security Prices. Graduate School of Business, The University of Chicago. Used with permission. All rights reserved. www.crsp.uchicago.edu.

Historical average percentage of total capitalization shows the average, over the last 78 years, of the decile market values as a percentage of the total NYSE/AMEX/NASDAQ calculated each month. Number of companies in deciles, recent market capitalization of deciles, and recent percentage of total capitalization are as of September 30, 2003.

Table 7-2 gives the current breakpoints that define the composition of the NYSE/AMEX/NASDAQ size deciles. The largest company and its market capitalization are presented for each decile. Table 7-3 shows the historical breakpoints for each of the three size groupings presented throughout this chapter. Mid-cap stocks are defined here as the aggregate of deciles 3–5. Based on the most recent data (Table 7-2), companies within this mid-cap range have market capitalizations at or below $4,794,027,000 but greater than $1,166,799,000. Low-cap stocks include deciles 6–8 and currently include all companies in the NYSE/AMEX/NASDAQ with market capitalizations at or below $1,166,799,000 but greater than $330,608,000. Micro-cap stocks include deciles 9–10 and include companies with market capitalizations at or below $330,608,000. The market capitalization of the smallest company included in the micro-capitalization group is currently $332 thousand.

Table 7-2

Size-Decile Portfolios of the NYSE/AMEX/NASDAQ, Largest Company and Its Market Capitalization by Decile
September 30, 2003

Decile	Market Capitalization of Largest Company (in thousands)	Company Name
1-Largest	$286,638,305	General Electric Co.
2	11,366,767	Masco Corp.
3	4,794,027	EOG Resources Inc.
4	2,585,984	Toys R Us Inc.
5	1,720,959	International Rectifier Corp.
6	1,166,799	Thor Industries Inc.
7	795,983	Granite Construction Inc.
8	507,820	Steelcase Inc.
9	330,608	Sterling Bancorp
10-Smallest	166,414	Ethyl Corp.

Source: Center for Research in Security Prices, University of Chicago.

Presentation of the Decile Data

Summary statistics of annual returns of the 10 deciles over 1926–2003 are presented in Table 7-4. Note from this exhibit that both the average return and the total risk, or standard deviation of annual returns, tend to increase as one moves from the largest decile to the smallest. Furthermore, the serial correlations of returns are near zero for all but the smallest two deciles. Serial correlations and their significance will be discussed in detail later in this chapter.

Graph 7-1 depicts the growth of one dollar invested in each of three NYSE/AMEX/NASDAQ groups broken down into mid-cap, low-cap, and micro-cap stocks. The index value of the entire NYSE/AMEX/NASDAQ is also included. All returns presented are value-weighted based on the market capitalizations of the deciles contained in each subgroup. The sheer magnitude of the size effect in some years is noteworthy. While the largest stocks actually declined in 1977, the smallest stocks rose more than 20 percent. A more extreme case occurred in the depression-recovery year of 1933, when the difference between the first and tenth decile returns was far more substantial. This divergence in the performance of small and large company stocks is a common occurrence.

Table 7-3

Size-Decile Portfolios of the NYSE/AMEX/NASDAQ
Largest and Smallest Company by Size Group

from 1926 to1965

	Capitalization of Largest Company (in thousands)			Capitalization of Smallest Company (in thousands)		
Date (Sept 30)	Mid-Cap 3-5	Low-Cap 6-8	Micro-Cap 9-10	Mid-Cap 3-5	Low-Cap 6-8	Micro-Cap 9-10
1926	$61,490	$14,040	$4,305	$14,100	$4,325	$43
1927	$65,281	$14,746	$4,450	$15,311	$4,496	$72
1928	$81,998	$18,975	$5,074	$19,050	$5,119	$135
1929	$107,085	$24,328	$5,875	$24,480	$5,915	$126
1930	$67,808	$13,050	$3,219	$13,068	$3,264	$30
1931	$42,607	$8,142	$1,905	$8,222	$1,927	$15
1932	$12,431	$2,170	$473	$2,196	$477	$19
1933	$40,298	$7,210	$1,830	$7,280	$1,875	$100
1934	$38,129	$6,669	$1,669	$6,734	$1,673	$68
1935	$37,631	$6,519	$1,350	$6,549	$1,383	$38
1936	$46,920	$11,505	$2,660	$11,526	$2,668	$98
1937	$51,750	$13,601	$3,500	$13,635	$3,539	$68
1938	$36,102	$8,325	$2,125	$8,372	$2,145	$60
1939	$35,784	$7,367	$1,697	$7,389	$1,800	$75
1940	$31,050	$7,990	$1,861	$8,007	$1,872	$51
1941	$31,744	$8,316	$2,086	$8,336	$2,087	$72
1942	$26,135	$6,870	$1,779	$6,875	$1,788	$82
1943	$43,218	$11,475	$3,847	$11,480	$3,903	$395
1944	$46,621	$13,066	$4,800	$13,068	$4,812	$309
1945	$55,268	$17,325	$6,413	$17,575	$6,428	$225
1946	$79,158	$24,192	$10,013	$24,199	$10,051	$829
1947	$57,830	$17,735	$6,373	$17,872	$6,380	$747
1948	$67,238	$19,575	$7,313	$19,651	$7,329	$784
1949	$55,506	$14,549	$5,037	$14,577	$5,108	$379
1950	$65,881	$18,675	$6,176	$18,750	$6,201	$303
1951	$82,517	$22,750	$7,567	$22,860	$7,598	$668
1952	$97,936	$25,452	$8,428	$25,532	$8,480	$480
1953	$98,595	$25,374	$8,156	$25,395	$8,168	$459
1954	$125,834	$29,645	$8,484	$29,707	$8,488	$463
1955	$170,829	$41,445	$12,353	$41,681	$12,366	$553
1956	$183,434	$46,805	$13,481	$46,886	$13,524	$1,122
1957	$192,861	$47,658	$13,844	$48,509	$13,848	$925
1958	$195,083	$46,774	$13,789	$46,871	$13,816	$550
1959	$253,644	$64,221	$19,500	$64,372	$19,548	$1,804
1960	$246,202	$61,485	$19,344	$61,529	$19,385	$831
1961	$296,261	$79,058	$23,562	$79,422	$23,613	$2,455
1962	$250,433	$58,866	$18,952	$59,143	$18,968	$1,018
1963	$308,438	$71,846	$23,819	$71,971	$23,822	$296
1964	$344,033	$79,343	$25,594	$79,508	$25,595	$223
1965	$363,759	$84,479	$28,365	$84,600	$28,375	$250

Source: Center for Research in Security Prices, University of Chicago.

Table 7-3 (continued)

Size-Decile Portfolios of the NYSE/AMEX/NASDAQ
Largest and Smallest Company by Size Group

from 1966 to 2003

	Capitalization of Largest Company (in thousands)			Capitalization of Smallest Company (in thousands)		
Date (Sept 30)	Mid-Cap 3-5	Low-Cap 6-8	Micro-Cap 9-10	Mid-Cap 3-5	Low-Cap 6-8	Micro-Cap 9-10
1966	$399,455	$99,578	$34,884	$99,935	$34,966	$381
1967	$459,170	$117,985	$42,267	$118,329	$42,313	$381
1968	$528,326	$149,261	$60,351	$150,128	$60,397	$592
1969	$517,452	$144,770	$54,273	$145,684	$54,280	$2,119
1970	$380,246	$94,025	$29,910	$94,047	$29,916	$822
1971	$542,517	$145,340	$45,571	$145,673	$45,589	$865
1972	$545,211	$139,647	$46,728	$139,710	$46,757	$1,031
1973	$424,584	$94,809	$29,601	$95,378	$29,606	$561
1974	$344,013	$75,272	$22,475	$75,853	$22,481	$444
1975	$465,763	$96,954	$28,140	$97,266	$28,144	$540
1976	$551,071	$116,184	$31,987	$116,212	$32,002	$564
1977	$573,084	$135,804	$39,192	$137,323	$39,254	$513
1978	$572,967	$159,778	$46,621	$160,524	$46,629	$830
1979	$661,336	$174,480	$49,088	$174,517	$49,172	$948
1980	$754,562	$194,012	$48,671	$194,241	$48,953	$549
1981	$954,665	$259,028	$71,276	$261,059	$71,289	$1,446
1982	$762,028	$205,590	$54,575	$206,536	$54,883	$1,060
1983	$1,200,680	$352,698	$103,443	$352,944	$103,530	$2,025
1984	$1,068,972	$314,650	$90,419	$315,214	$90,659	$2,093
1985	$1,432,342	$367,413	$93,810	$368,249	$94,000	$760
1986	$1,857,621	$444,827	$109,956	$445,648	$109,975	$705
1987	$2,059,143	$467,430	$112,035	$468,948	$112,125	$1,277
1988	$1,957,926	$420,257	$94,268	$421,340	$94,302	$696
1989	$2,147,608	$480,975	$100,285	$483,623	$100,384	$96
1990	$2,164,185	$472,003	$93,627	$474,065	$93,750	$132
1991	$2,129,863	$457,958	$87,586	$458,853	$87,733	$278
1992	$2,428,671	$500,346	$103,352	$501,050	$103,500	$510
1993	$2,711,068	$608,520	$137,945	$608,825	$137,987	$602
1994	$2,497,073	$601,552	$149,435	$602,552	$149,532	$598
1995	$2,793,761	$653,178	$158,011	$654,019	$158,063	$89
1996	$3,150,685	$763,377	$195,188	$763,812	$195,326	$1,043
1997	$3,511,132	$818,299	$230,472	$821,028	$230,554	$480
1998	$4,216,707	$934,264	$253,329	$936,727	$253,336	$1,671
1999	$4,251,741	$875,309	$218,336	$875,582	$218,368	$1,502
2000	$4,143,902	$840,000	$192,598	$840,730	$192,721	$1,462
2001	$5,252,063	$1,114,792	$269,275	$1,115,200	$270,391	$443
2002	$5,012,705	$1,143,845	$314,042	$1,144,452	$314,174	$501
2003	$4,794,027	$1,166,799	$330,608	$1,167,040	$330,797	$332

Source: Center for Research in Security Prices, University of Chicago.

Table 7-4

Size-Decile Portfolios of the NYSE/AMEX/NASDAQ, Summary Statistics of Annual Returns 1926–2003

Decile	Geometric Mean	Arithmetic Mean	Standard Deviation	Serial Correlation
1-Largest	9.6%	11.4%	19.40%	0.09
2	10.8	13.2	22.12	0.03
3	11.2	13.8	24.00	–0.02
4	11.4	14.4	26.31	–0.02
5	11.5	14.9	27.18	–0.02
6	11.7	15.3	28.12	0.03
7	11.5	15.6	30.41	0.01
8	11.7	16.6	33.90	0.04
9	12.1	17.8	37.08	0.06
10-Smallest	13.9	21.7	45.95	0.15
Mid-Cap, 3–5	11.3	14.2	25.10	–0.02
Low-Cap, 6–8	11.7	15.7	29.88	0.03
Micro-Cap, 9–10	12.7	19.0	39.65	0.08
NYSE/AMEX/NASDAQ				
Total Value-Weighted Index	10.1	12.1	20.46	0.03

Source: Center for Research in Security Prices, University of Chicago.

Aspects of the Firm Size Effect

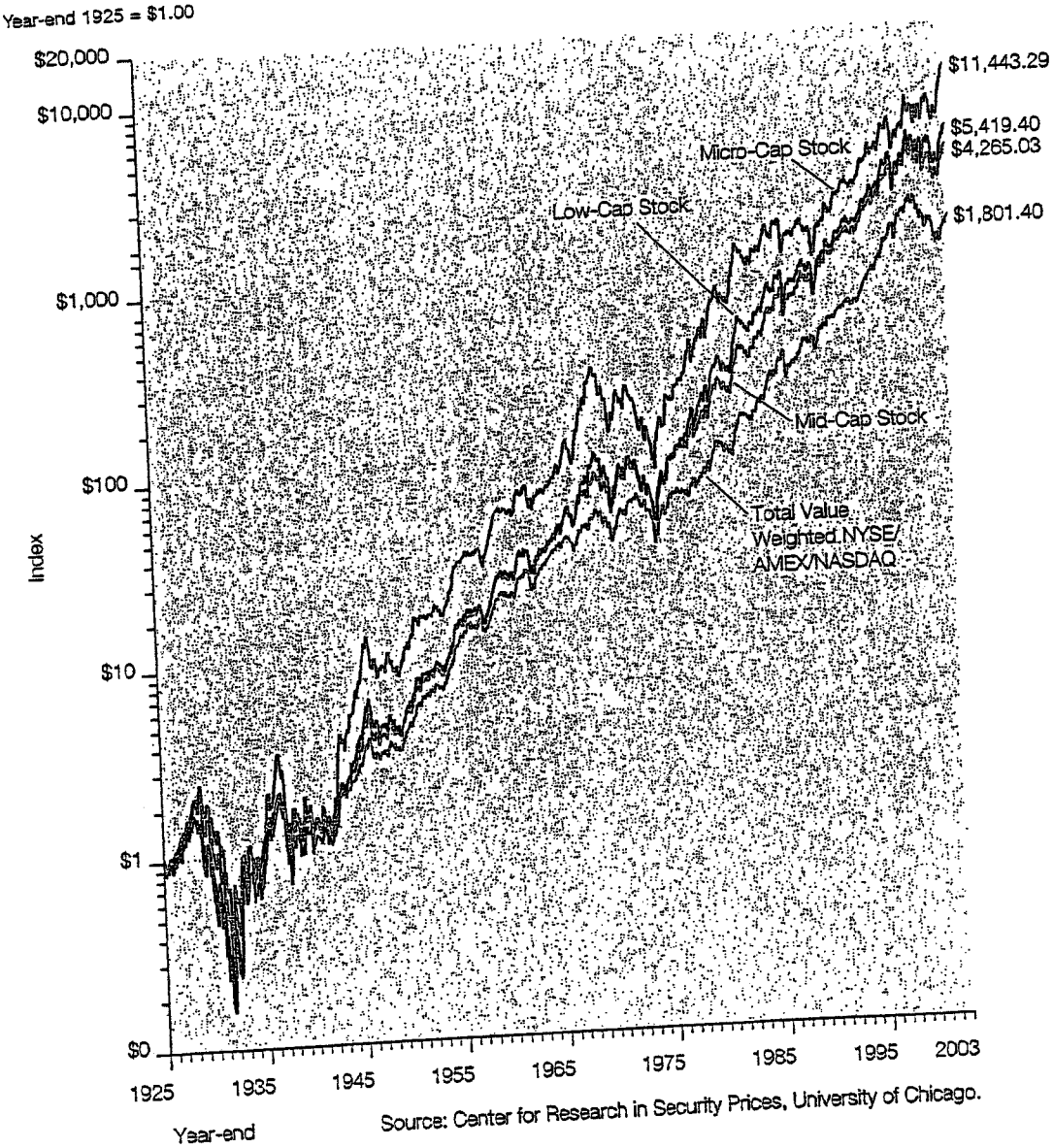
The firm size phenomenon is remarkable in several ways. First, the greater risk of small stocks does not, in the context of the capital asset pricing model (CAPM), fully account for their higher returns over the long term. In the CAPM, only systematic or beta risk is rewarded; small company stocks have had returns in excess of those implied by their betas.

Second, the calendar annual return differences between small and large companies are serially correlated. This suggests that past annual returns may be of some value in predicting future annual returns. Such serial correlation, or autocorrelation, is practically unknown in the market for large stocks and in most other equity markets but is evident in the size premia.

Third, the firm size effect is seasonal. For example, small company stocks outperformed large company stocks in the month of January in a large majority of the years. Such predictability is surprising and suspicious in light of modern capital market theory. These three aspects of the firm size effect—long-term returns in excess of systematic risk, serial correlation, and seasonality—will be analyzed thoroughly in the following sections.

Graph 7-1

Size-Decile Portfolios of the NYSE/AMEX/NASDAQ: Wealth Indices of Investments in Mid-, Low-, Micro- and Total Capitalization Stocks
1925–2003
Year-end 1925 = $1.00



Source: Center for Research in Security Prices, University of Chicago.

Long-Term Returns in Excess of Systematic Risk

The capital asset pricing model (CAPM) does not fully account for the higher returns of small company stocks. Table 7-5 shows the returns in excess of systematic risk over the past 78 years for each decile of the NYSE/AMEX/NASDAQ. Recall that the CAPM is expressed as follows:

$$k_s = r_f + (\beta_s \times ERP)$$

Table 7-5 uses the CAPM to estimate the return in excess of the riskless rate and compares this estimate to historical performance. According to the CAPM, the expected return on a security should consist of the riskless rate plus an additional return to compensate for the systematic risk of the security. The return in excess of the riskless rate is estimated in the context of the CAPM by multiplying the equity risk premium by β (beta). The equity risk premium is the return that compensates investors for taking on risk equal to the risk of the market as a whole (systematic risk).[2] Beta measures the extent to which a security or portfolio is exposed to systematic risk.[3] The beta of each decile indicates the degree to which the decile's return moves with that of the overall market.

A beta greater than one indicates that the security or portfolio has greater systematic risk than the market; according to the CAPM equation, investors are compensated for taking on this additional risk. Yet, Table 7-5 illustrates that the smaller deciles have had returns that are not fully explainable by their higher betas. This return in excess of that predicted by CAPM increases as one moves from the largest companies in decile 1 to the smallest in decile 10. The excess return is especially pronounced for micro-cap stocks (deciles 9–10). This size-related phenomenon has prompted a revision to the CAPM, which includes a size premium. Chapter 4 presents this modified CAPM theory and its application in more detail.

This phenomenon can also be viewed graphically, as depicted in the Graph 7-2. The security market line is based on the pure CAPM without adjustment for the size premium. Based on the risk (or beta) of a security, the expected return lies on the security market line. However, the actual historic returns for the smaller deciles of the NYSE/AMEX/NASDAQ lie above the line, indicating that these deciles have had returns in excess of that which is appropriate for their systematic risk.

2 The equity risk premium is estimated by the 78-year arithmetic mean return on large company stocks, 12.41 percent, less the 78-year arithmetic mean income-return component of 20-year government bonds as the historical riskless rate, in this case 5.23 percent. (It is appropriate, however, to match the maturity, or duration, of the riskless asset with the investment horizon.) See Chapter 5 for more detail on equity risk premium estimation.

3 Historical betas were calculated using a simple regression of the monthly portfolio (decile) total returns in excess of the 30-day U.S. Treasury bill total returns versus the S&P 500 total returns in excess of the 30-day U.S. Treasury bill, January 1926–December 2003. See Chapter 6 for more detail on beta estimation.

Table 7-5

Long-Term Returns in Excess of CAPM Estimation for Decile Portfolios of the NYSE/AMEX/NASDAQ 1926–2003

Decile	Beta*	Arithmetic Mean Return	Realized Return in Excess of Riskless Rate**	Estimated Return in Excess of Riskless Rate†	Size Premium (Return in Excess of CAPM)
1-Largest	0.91	11.43%	6.21%	6.54%	-0.34%
2	1.04	13.16%	7.94%	7.44%	0.50%
3	1.10	13.78%	8.55%	7.88%	0.67%
4	1.13	14.43%	9.20%	8.09%	1.11%
5	1.16	14.91%	9.68%	8.32%	1.36%
6	1.18	15.32%	10.09%	8.50%	1.59%
7	1.23	15.65%	10.42%	8.85%	1.57%
8	1.28	16.64%	11.42%	9.16%	2.25%
9	1.34	17.76%	12.53%	9.63%	2.90%
10-Smallest	1.41	21.73%	16.50%	10.16%	6.34%
Mid-Cap, 3-5	1.12	14.16%	8.93%	8.02%	0.91%
Low-Cap, 6-8	1.22	15.67%	10.44%	8.74%	1.70%
Micro-Cap, 9-10	1.36	18.98%	13.75%	9.74%	4.01%

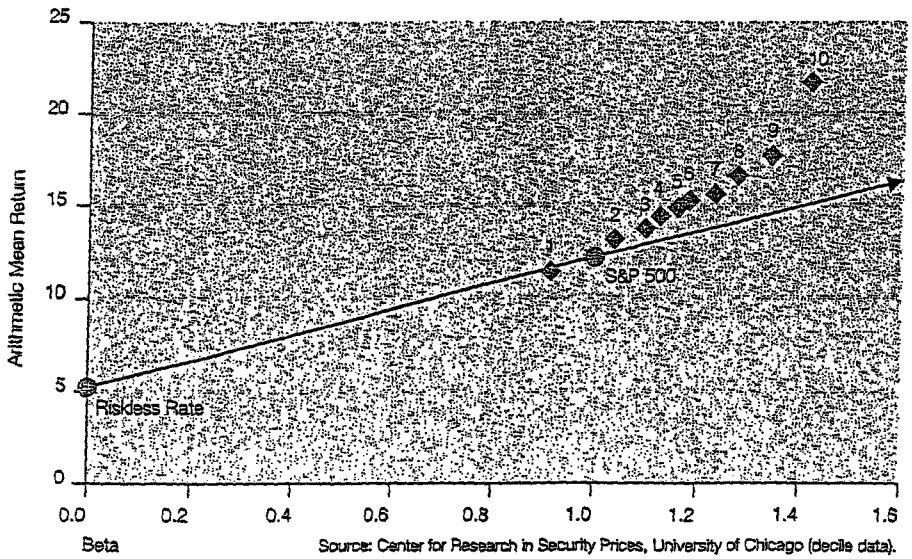
*Betas are estimated from monthly portfolio total returns in excess of the 30-day U.S. Treasury bill total return versus the S&P 500 total returns in excess of the 30-day U.S. Treasury bill, January 1926–December 2003.

**Historical riskless rate is measured by the 78-year arithmetic mean income return component of 20-year government bonds (5.23 percent).

†Calculated in the context of the CAPM by multiplying the equity risk premium by beta. The equity risk premium is estimated by the arithmetic mean total return of the S&P 500 (12.41 percent) minus the arithmetic mean income return component of 20-year government bonds (5.23 percent) from 1926–2003.

Graph 7-2

Security Market Line versus Size-Decile Portfolios of the NYSE/AMEX/NASDAQ 1926–2003



Source: Center for Research in Security Prices, University of Chicago (decile data).

Further Analysis of the 10th Decile

The size premia presented thus far do a great deal to explain the return due solely to size in publicly traded companies. However, by splitting the 10th decile into two size groupings we can get a closer look at the smallest companies. This magnification of the smallest companies will demonstrate whether the company size to size premia relationship continues to hold true.

As previously discussed, the method for determining the size groupings for size premia analysis was to take the stocks traded on the NYSE and break them up into 10 deciles, after which stocks traded on the AMEX and NASDAQ were allocated into the same size groupings. This same methodology was used to split the 10th decile into two parts: 10a and 10b, with 10b being the smaller of the two. This is equivalent to breaking the stocks down into 20 size groupings, with portfolios 19 and 20 representing 10a and 10b.

Table 7-7 shows that the pattern continues; as companies get smaller their size premium increases. There is a noticeable increase in size premium from 10a to 10b, which can also be demonstrated visually in Graph 7-3. This can be useful in valuing companies that are extremely small. Table 7-6 presents the size, composition, and breakpoints of deciles 10a and 10b. First, the recent number of companies and total decile market capitalization are presented. Then the largest company and its market capitalization are presented.

Breaking the smallest decile down lowers the significance of the results compared to results for the 10th decile taken as a whole, however. The same holds true for comparing the 10th decile with the Micro-Cap aggregation of the 9th and 10th deciles. The more stocks included in a sample the more significance can be placed on the results. While this is not as much of a factor with the recent years of data, these size premia are constructed with data back to 1926. By breaking the 10th decile down into smaller components we have cut the number of stocks included in each grouping. The change over time of the number of stocks included in the 10th decile for the NYSE/AMEX/NASDAQ is presented in Table 7-8. With fewer stocks included in the analysis early on, there is a strong possibility that just a few stocks can dominate the returns for those early years.

While the number of companies included in the 10th decile for the early years of our analysis is low, it is not too low to still draw meaningful results even when broken down into subdivisions 10a and 10b. All things considered, size premia developed for deciles 10a and 10b are significant and can be used in cost of capital analysis. These size premia should greatly enhance the development of cost of capital analysis for very small companies.

Table 7-6

Size-Decile Portfolios 10a and 10b of the NYSE/AMEX/NASDAQ, Largest Company and Its Market Capitalization
September 30, 2003

Decile	Recent Number of Companies	Recent Decile Market Capitalization (in thousands)	Market Capitalization of Largest Company (in thousands)	Company Name
10a	554	$75,931,424	$166,414	Ethyl Corp.
10b	1,158	$54,867,824	$96,928	Mesa Royalty Trust

Note: These numbers may not aggregate to equal decile 10 figures.
Source: Center for Research in Security Prices, University of Chicago.

Table 7-7

Long-Term Returns in Excess of CAPM Estimation for Decile Portfolios of the NYSE/AMEX/NASDAQ, with 10th Decile Split
1926–2003

	Beta*	Arithmetic Mean Return	Realized Return in Excess of Riskless Rate**	Estimated Return in Excess of Riskless Rate†	Size Premium (Return in Excess of CAPM)
1-Largest	0.91	11.43%	6.21%	6.54%	-0.34%
2	1.04	13.16%	7.94%	7.44%	0.50%
3	1.10	13.78%	8.55%	7.88%	0.67%
4	1.13	14.43%	9.20%	8.09%	1.11%
5	1.16	14.91%	9.68%	8.32%	1.36%
6	1.18	15.32%	10.09%	8.50%	1.59%
7	1.23	15.65%	10.42%	8.85%	1.57%
8	1.28	16.64%	11.42%	9.16%	2.25%
9	1.34	17.76%	12.53%	9.63%	2.90%
10a	1.42	19.93%	14.70%	10.20%	4.50%
10b-Smallest	1.40	25.08%	19.85%	10.03%	9.82%
Mid-Cap, 3–5	1.12	14.16%	8.93%	8.02%	0.91%
Low-Cap, 6–8	1.22	15.67%	10.44%	8.74%	1.70%
Micro-Cap, 9-10	1.36	18.98%	13.75%	9.74%	4.01%

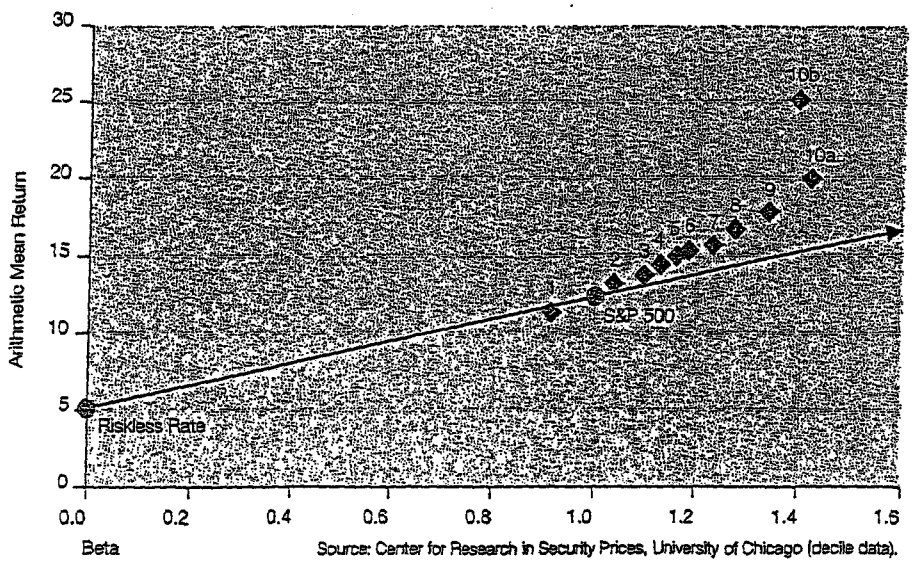
*Betas are estimated from monthly portfolio total returns in excess of the 30-day U.S. Treasury bill total return versus the S&P 500 total returns in excess of the 30-day U.S. Treasury bill, January 1926–December 2003.

**Historical riskless rate is measured by the 78-year arithmetic mean income return component of 20-year government bonds (5.23 percent).

†Calculated in the context of the CAPM by multiplying the equity risk premium by beta. The equity risk premium is estimated by the arithmetic mean total return of the S&P 500 (12.41 percent) minus the arithmetic mean income return component of 20-year government bonds (5.23 percent) from 1926–2003.

Graph 7-3

Security Market Line versus Size-Decile Portfolios of the NYSE/AMEX/NASDAQ, with 10th Decile Split
1926-2003



Source: Center for Research in Security Prices, University of Chicago (decile data).

Table 7-8
Historical Number of Companies for NYSE/AMEX/NASDAQ Decile 10

Sept.	Number of Companies
1926	52*
1930	72
1940	78
1950	100
1960	109
1970	865
1980	685
1990	1,814
2000	1,927
2003	1,724

*The fewest number of companies was 49 in March, 1926

Source: Center for Research in Security Prices, University of Chicago.

Alternative Methods of Calculating the Size Premia

The size premia estimation method presented above makes several assumptions with respect to the market benchmark and the measurement of beta. The impact of these assumptions can best be examined by looking at some alternatives. In this section we will examine the impact on the size premia of using a different market benchmark for estimating the equity risk premia and beta. We will also examine the effect on the size premia study of using sum beta or an annual beta.[4]

Changing the Market Benchmark

In the original size premia study, the S&P 500 is used as the market benchmark in the calculation of the realized historical equity risk premium and of each size group's beta. The NYSE total value-weighted index is a common alternative market benchmark used to calculate beta. Table 7-9 uses this market benchmark in the calculation of beta. In order to isolate the size effect, we require an equity risk premium based on a large company stock benchmark. The NYSE deciles 1–2 large company index offers a mutually exclusive set of portfolios for the analysis of the smaller company groups: mid-cap deciles 3–5, low-cap deciles 6–8, and micro-cap deciles 9–10. The size premia analyses using these benchmarks are summarized in Table 7-9 and depicted graphically in Graph 7-4.

For the entire period analyzed, 1926–2003, the betas obtained using the NYSE total value-weighted index are higher than those obtained using the S&P 500. Since smaller companies had higher betas using the NYSE benchmark, one would expect the size premia to shrink. However, as was illustrated in Chapter 5, the equity risk premium calculated using the NYSE deciles 1–2 benchmark results in a value of 6.40, as opposed to 7.19 when using the S&P 500. The effect of the higher betas and lower equity risk premium cancel each other out, and the resulting size premia in Table 7-9 are slightly higher than those resulting from the original study.

4 Sum beta is the method of beta estimation described in Chapter 6 that was developed to better account for the lagged reaction of small stocks to market movements. The sum beta methodology was developed for the same reason that the size premia were developed; small company betas were too small to account for all of their excess returns.